and which are glabrous. The two forms of exactness correspond to the two ways in which we may try to make certain of hitting the bull's-eye of a target when we shoot at it. We may either improve our marksmanship or enlarge the bull's-eye. The latter is the only method of ensuring uniformity, of enabling oneself to predict the result with certainty. To this the biometrician justly replies, "This is no real uniformity. It is an ideal uniformity substituted for a real variability. Your shots are scattered round the centre of your bull's-eye just as mine are scattered outside mine. I never hit. My bull's-eye is a point. I keep a record of the deviation of every single shot from it. I am faithful." To which the Mendelian replies, "I always hit. I keep no such records. I am successful." We do not hold a brief for either party. A bull's-eye so large that it cannot be missed is as unfair as one so small that it cannot be seen is unpractical. All we wish to insist on is that because Mendelians can predict and biometricians cannot, it does not follow that the units with which the Mendelian deals are the units of which the biometrician's masses are composed. The Mendelian's units *are* the biometrician's masses, except when the latter exceeds his limits and includes within his masses more than one such unit. The Mendelian can no more predict about the units of which the biometrician's masses are composed than the biometrician can, except when the biometrician includes more than one Mendelian unit in his mass.

CERTAIN ASPECTS OF SCIENTIFIC WORK.

Progress of Science in the Century. By Prof. J. Arthur Thomson. Pp. x + 536. (London: W. and R. Chambers, Ltd., 1906.) Price 5*s.* net.

IN a book bearing the present title it is surely unfortunate to find that progress in one branch of science, and that certainly not the least important, is wholly ignored. Yet while chemistry, physics, astronomy, geology, physiology, psychology, and even sociology each has a separate chapter devoted to it, not a word is said about the remarkable developments that have taken place in mathematical science during the century. The changes which recent times have witnessed in regard to our conceptions of the notion of space are certainly no less remarkable, and are quite as capable of being outlined in a popular work as the kinetic theory of gases or developments of theories of the ether.

The study of matter and energy is so closely connected with the study of space that a discussion of the former without some reference to the latter must give a reader an incorrect impression of the present state of physical science. But the omission of frequent and explicit mention of the work of the mathematician in certain other directions is also likely to be misleading. Why, the reader may ask, is Lord Kelvin's vortex atom theory recognised—we will not say accepted—by the scientific world while Mr. Horatio Gubbins (to use a fancy name) has been pestering secretaries of societies and editors in vain with his theories of gravitation or the ether, and no scientific man will have anything to say to him? It may be that the reader in question is Mr. Gubbins himself. If he studies the chapters on "The Scientific Mood" and "The Unity of Science," he will find in them every justification for believing that his grand discovery marks a new era in the advancement of science. If, again, he turns to p. 178 and reads the paragraph "Value of these Hypotheses" at the end of the chapter on physics, he will find the sentence:—

"These molecular and ethereal hypotheses are human imaginings—and nothing more; they are constructed in terms of one sense; that of sight; they are attempts to see that which is invisible, to invent a machinery of Nature, since the real mechanism is beyond our ken; but it must be observed that these hypotheses are not *vain* imaginings, for they prove themselves yearly most effective tools of research, and that they are not *random* guesses, for they are constructed in harmony with known facts."

This statement may be true enough, but the *suppressio veri* in the omission of all reference to the rigid framework of mathematical equations and formulæ supporting the hypotheses conveys a dangerous *suggestio falsi* to the unmathematical reader. Mr. Gubbins is perfectly convinced that his own theory, at any rate, is constructed in harmony with known facts, whatever may be said about Lord Kelvin's theories, which he not unfrequently has "*proved convincingly*" are wrong, and he may even take unto himself to say that he has at last discovered a theory which is something more than a mere human imagining. No book of the present kind should be issued which does not strongly emphasise the fact that the true test of every scientific theory is in all cases a quantitative test based on a comparison of the formulæ of the mathematician with the measurements of the experimenter. Otherwise the English reader will be led to believe that the needs of science, which are now being pressed forward, can be adequately met by the erection of laboratories and the endowment of scholarships for passing elementary examinations, while the brain workers who interest themselves in researches carried out in their own studies with ink and paper will find themselves, as time goes on, more and more unable to cope with the accumulation of unsolved problems that is being pressed on them from every quarter.

Descending to matters of detail, we find many important theories conspicuous by their absence. We need only specify the phase rule and the second law of thermodynamics as instances in point. Yet the very possibility of a world existing which is inhabited by living beings, including man, depends essentially on this neglected second law. It seems almost unnecessary, in view of this omission, that the author should apologise in his preface for the absence of any reference to radium on the ground that the book was printed before the discovery had been made.

It cannot be denied that in attempting to trace the scientific progress of a century, even in its barest outlines, in a volume of this size the author undertook an impossible task. It is probable that he would have done better if he had confined his attention to

discoveries made in the earlier part of the century, merely sketching their later developments. We do not blame the author for omitting many discoveries of importance, but it is a great pity that he did not realise that the present selection gives a somewhat one-sided view of scientific aims and methods.

Having said so much about a weak point in the book, it would be unfair not to dwell on several useful features. The specialist working in one branch of science is very apt to forget what he ever learnt about other directions of scientific progress. In these days, over-specialisation and over-elaboration are being carried to greater excess every year. Even the subdivision of the Royal Society's Proceedings into two series has completely destroyed their former all-round character. A book like the present, taken up and read in a leisure hour, will recall to the specialist many interesting points in the history of different branches of science of which he would otherwise never think. If there is one class of specialist who is more likely than others to benefit by reading the book, that is the mathematician himself, and next to him, possibly, the physicist. These, in particular, will be brought into contact with ideas quite different from those with which they are commonly associated, and it may be hoped that the mathematician will learn a lesson, and be less prone to hide his light under a bushel, when he finds how his genius is unappreciated by the writers of popular treatises. G. H. BRYAN.

ANCIENT AND MODERN LEICESTER.

Glimpses of Ancient Leicester in Six Periods. By Mrs. T. Fielding Johnson. Second edition, with supplementary notes. Pp. xv+439. (Leicester: Clarke and Satchell; London: Simpkin, Marshall and Co., Ltd., 1906.)

THIS book was first published in 1892 as a "History of Leicester from the Earliest Times to the End of the Eighteenth Century." The present edition has been enlarged considerably by a supplement, in which more recent developments have been dealt with. The author belongs to a Leicester family which has taken a leading part in the public life of the town for several generations. Local histories are wont to be rather dull, but in this case, thanks to a lucid and lively style, the writer has succeeded in producing a volume of more than usual attraction for the general reader.

Leicester appears to have been an important Roman settlement, of which the chief remains are a part of the old rampart, now called the "Jewry Wall"; some fine examples of tesselated pavements; and a milestone with an inscription to the Emperor Hadrian, said to be the oldest stone inscription in Britain. During Saxon times the Church of St. Nicholas was built on the site of a Roman temple. This church "still includes in the north wall of its nave portions of the identical walls of the original Saxon church, showing a quantity of material taken from the Jewry Wall and other ruined Roman buildings near the spot." "Under the Norman and Plantagenet kings, Leicester reached its highest point of importance as a mediæval borough," under its greatest earl, Simon de Montfort. Several buildings of this period are in existence; amongst them may be mentioned the Newark Gateway and the Old Town Hall. Memorials of the sixteenth century may still be seen in the Abbey and the Queen Elizabeth Grammar School.

The supplement gives an interesting account of the development of the place from a market town with a population of 17,000 at the end of the eighteenth century into an industrial centre of nearly a quarter of a million people.

In this connection reference should be made to the excellent description of the rise and progress of the present important knitting and hosiery trade. A great impulse was given to the prosperity of the town by the opening of the Leicester and Swannington Railway. This was the second railway in the country, and was built by George Stephenson in 1832. Some of the original rails and other specimens of early railway work are preserved in the town museum.

This useful institution owes its origin to the Literary and Philosophical Society, through which it gained the nucleus of its present valuable collection. The scientific activity of the town has always centred round this society, which was founded in 1835.

The attention of the reader of Mrs. Fielding Johnson's book will be attracted to the names of several of her townsmen who have attained distinction in scientific pursuits, amongst whom may be mentioned Russel Wallace, the naturalist Bates, and another, not so well known, Mr. Ludlam, who assisted Dollond in the production of achromatic lenses for his telescopes.

The history of the educational institutions of the town receives adequate treatment. Secondary education is mainly in the hands of the Wyggeston and Queen Elizabeth Grammar Schools, and Alderman Newton's School, the latter an eighteenth-century foundation. During last century a working men's college and a mechanics' institute were started. The former does useful work still, whilst the latter has developed into a fine technical school.

A special interest attaches to the new edition of this attractive work in view of the forthcoming visit of the British Association to Leicester, and intending visitors would find in it a pleasanter account of their place of meeting than the pages of an ordinary guide-book can afford. The book is admirably illustrated, and is provided with an index. R. E. T.

A NEW LIFE OF HUXLEY.

Thomas H. Huxley. By J. R. Ainsworth Davis. (English Men of Science Series.) Pp. xi+288. (London: J. M. Dent and Co., 1907.) Price 2s. 6d. net.

MR. DAVIS has produced in small compass an account of the life and work of Huxley that is at once readable and stimulating. It was inevitable that he should draw largely upon Mr. Leonard Huxley's biography of his illustrious father, but the materials have been skilfully employed, and the book